

M I C R O P R O C E S S O R

www.MPRonline.com

THE INSIDER'S GUIDE TO MICROPROCESSOR HARDWARE

MPR INNOVATION AWARD: ARM996HS

ARM and Handshake Solutions Debut Clockless Processor Core

By Tom R. Halfhill {2/20/07-03}

Microprocessor Report is presenting an **MPR Analysts' Choice Award** in the Innovation category to ARM and Handshake Solutions for the ARM996HS, the first commercially available 32-bit microprocessor core implemented in asynchronous (clockless) logic. ARM

introduced the ground-breaking processor in early 2006.

ARM's development partner on this project was Netherlands-based Handshake Solutions, which worked closely with ARM to bring the unconventional technology to market. If the ARM996HS succeeds, it could spark a revolution in microprocessor design. (See *MPR 2/21/06-01*, "Can ARM Beat the Clock?")

The ARM996HS isn't a high-performance processor, but it's power-efficient and boasts extremely low electromagnetic emissions. Because the ARM996HS is clockless, every part of the processor runs only as fast as it needs to run at any given moment. A processor running on self-timed logic instead of a global clock signal generates much less noise in the radio-frequency spectrum than a conventional processor does. Low noise can be as important as low power in tightly packed embedded systems that locate the processor near sensitive analog components and circuits.

In most respects, the clockless ARM996HS resembles the ARM968E-S, a conventional ARM9E-family processor core introduced in 2004. Both support the ARMv5TE instruction-set architecture.

As we noted in our first report on the ARM996HS in 2004, engineers all over the world have been working on the concept of asynchronous logic since the 1950s, long before microprocessors were invented. In particular, ARM and Handshake Solutions are building on pioneering research by



the University of Manchester and Ivan Sutherland. (See *MPR 11/29/04-02*, "ARM's Asynchronous Handshake," and *MPR 2/25/02-01*, "Technology 2001: On a Clear Day You Can See Forever.")

Now, ARM is finally on the verge of realizing a long-held dream. Delivering the first commercially available clockless 32-bit microprocessor core to a customer is a historic milestone. ♦

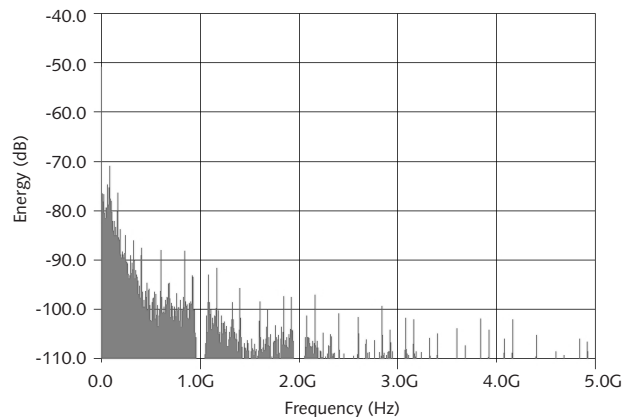


Figure 1. The clockless ARM996HS processor draws much lower peak currents and therefore emits less electromagnetic interference than the similar ARM968E-S does.